REMARKS

This amendment responds to the office action mailed July 3, 2007. In summary, in the office action the Examiner:

- rejected claims 1, 4, 5, 8, and 11 under 35 U.S.C. 103 as being unpatentable over Soichiro Kawakami (JP 61037969) in view of Ohashi (JP10-177960);
- rejected claim 6 under 35 U.S.C. 103(a) as being unpatentable over Soichiro Kawakami in view of Ohashi as applied to claims 1 and 11 above and further in view of Ishii (US 5,685,942);
- rejected claim 7 under 35 U.S.C. 103(a) as being unpatentable over Soichiro Kawakami in view of Ohashi as applied to claims 1 and 11 above and further in view of Lemp (US 4,836,246); and
- rejected claims 9 and 10 under 35 U.S.C. 103(a) as being unpatentable over Soichiro Kawakami in view of Ohashi as applied to claims 1 and 11 above and further in view of DeDotney (US 5,849,088).

Claim Revisions and New Claims

Claims 2-3 and 12-15 have been cancelled.

The claims have been amended to correct typographical errors and more particularly describe the present invention. For example, claim 1 has been amended to more positively claim and clearly describe the gas flow divider and first and second gas flow paths. In order to differentiate between the arrays of orifices in the outer tube and the inner tube, claims 1 and 11 have been amended to call for arrays of outer orifices and arrays of inner orifices. Claims 1 and 11 have further been amended to call for the arrays of orifices on the *surface* of the tubes, which more particularly describes the present invention as shown and described in the application as originally filed.

Although Applicants disagree with the Examiner's rejection, claim 1 has been amended to call for the first gas flow path to travel out of the outlet end of the inner tube *adjacent* the closed end of the outer tube to more clearly describe the present invention. In particular, as described in the specification as originally filed and illustrated at least in FIGs. 5 and 11, the gas travels out of the outlet end of the inner tube, which is adjacent the closed end of the outer tube. The first gas flow path then turns back into the annular space. Likewise, claim 11 has been amended to more clearly describe the gas flow paths.

New claims 16 and 17 have been added to the application. Support for new claim 16 may be found in the application as originally filed including at least paragraph 0031 and FIGs. 5 and 6a. Support for new claim 17 may be found at least in FIG. 5.

Among other things, claim 16 calls for "the inner array orifices are aligned substantially 180° from the outer array of orifices." The cited art fails to teach or suggest such a feature. Claim 17 calls for an *elongated* inner tube with "a length of the outer tube is substantially greater than a diameter of the outer tube" in contrast to the short, squat apparatus taught by Kawakami. For at least these reasons claims 16 and 17 are submitted to be allowable over the cited art.

Response to 35 U.S.C. § 103 Rejections

Claim 1, 4, 5, 8, and 11

Claims 1, 4, 5, 8, and 11 stand rejected under 35 U.S.C. 103 as being unpatentable over Japanese Patent Application No. 61037969 to Soichiro Kawakami ("Kawakami") in view of Japanese Patent Application No. 10-177960 Ohashi ("Ohashi"). Applicants respectfully traverse.

Kawakami in view of Ohashi fail to teach or suggest a metering tube including a gas flow divider, inner tube, outer tube, and gas supply port as called for by independent claims 1 and 11 as amended.

Kawakami in view of Ohashi fail to teach or suggest a metering tube including a gas flow divider configured to introduce a first gas flow path into an inlet end of an inner tube and a second gas flow path into an annular space, wherein gas in said first gas flow path travels out of the outlet end of the inner tube adjacent a closed end of the outer tube and back into the annular space. Kawakami discloses a plasma CVD apparatus with a series of short, coaxial tubes. The apparatus includes an inner electrode and partition walls having openings, the openings in respective coaxial walls being spaced to diffuse gas exiting the apparatus. Gas flows through an inlet or supply pipe 5 and subsequently flows radially outward near the middle of cathode 1a. As gas flows radially outward, it is separated and diffused to unify the flow exiting the outermost openings.

In contrast, the gas flow divider of the present invention is configured to divide gas from a gas supply port wherein gas in a first gas flow path travels out of the outlet end of the

inner tube adjacent the closed end of the outer tube. By directing the gas flow through the inner tube and out the end adjacent the closed end of the outer tube, uniform backing pressure is created. In the Kawakami apparatus, the gas flows out of the supply tube and then out opening 12a in a middle of partition tube 2c. Moreover, even if the gas is considered to flow out an outlet end of an inner tube, it exits at the middle of tube 1, not adjacent an end or even a closed end. Thus, if the gas were directed back into an annular space in the device of Kawakami, the backing pressure would not be uniform because the pressure would be applied only along half the space.

Ohashi fails to make up for the deficiencies of Kawakami. Ohashi discloses a cylinder with a straightening vane at an upper end. The straightening vane directs flow through a central portion at a different rate than it directs flow out openings in an outer portion. Thus, Ohashi is directed to adjusting the flow around the substrate relative to the central flow rate so as to minimize flow turbulence in the substrate area. Ohashi therefore fails to teach or suggest a gas flow divider and first gas flow path as called for by claim 1.

Further Kawakami in view of Ohashi fail to teach or suggest a gas flow divider that comprises a disk having a central orifice. Kawakami does not disclose or suggest a gas flow divider comprising a disk. Ohashi fails to make up for the deficiencies of Kawakami. As shown in FIGs. 2-3, Ohashi's straightening vane 17 includes a plurality of orifices in a middle portion. However, Ohashi does not teach or suggest a single central orifice. In fact, none of the openings are even in the center of the vane. All the orifices are dispersed around a central axis.

Additionally, Kawakami in view of Ohashi fail to teach or suggest a metering tube including a first gas flow path and one or more arrays of outer orifices "configured to establish uniform backing pressure in the annular space and uniform gas flow along the length of the outer tube" as called for by claim 1.

In response to Applicants previous arguments that the cited art fails to teach or suggest the arrays of orifices in the outer tube as called for by claim 1, the Examiner states that "when the structure recited in the reference is substantially identical to that of the claims ... claimed properties or functions are presumed inherent." Office Action mailed June 7, 2007, at paragraph 3(iv). In the instant case, neither Kawakami nor Ohashi "recite" the structure called for by the claims. In fact, in paragraph 3, the Examiner admits that

Kawakami's array of orifices do not teach the arrays of orifices called for by claim 1 but instead require modification.

Kawakami does not disclose a structure including the arrays of outer orifices called for by claim 1. Kawakami discloses an inner cathode and a series of short, coaxial tubes surrounding the cathode. The outermost openings feed the gas flow to a counter electrode supporting a substrate. Kawakami fails to teach or suggest an array of outer openings configured to establish uniform backing pressure within an annular space and uniform gas flow along the length of the outer tube. Instead, Kawakami teaches use of a different structure to create uniform flow, namely, a plurality of partitions and staggered openings. Kawakami teaches varying the relation of the openings with respect to each other in combination with a series of coaxial tubes in order to regulate pressure.

Again, Ohashi fails to make up for the deficiencies of Kawakami. As explained above, Ohashi fails to teach or suggest any configuration, let alone arrays of orifices, configured to create uniform backing pressure. In fact, Ohashi teaches away because Ohashi is directed to creating non-uniform flow rates toward the substrate in an effort to counter the turbulent effects of the substrate in the chamber. In contrast, the present invention is directed towards creating uniform gas flow along the length of the outer tube.

Furthermore, as asserted in the *AMENDMENT AND REPLY* filed August 8, 2005, incorporated herein, Kawakami in view of Ohashi fail to teach or suggest an inner tube that "extends a distance at least encompassing the arrays of outer orifices" as called for by claim 1. As best illustrated in FIGs. 1 and 4 of Kawakami, supply pipe 5 only extends about midway along the length of cathode 1a. As seen in the figure, some of the openings 7a in the cathode are above the uppermost end of pipe 5. In contrast, the inner tube of the present invention encompasses the arrays of outer orifices such that gas flowing out of the outlet of the inner tube and back into the annular space applies backing pressure to all the orifices in the outer tube.

Kawakami in view of Ohashi also fail to teach or suggest a single gas supply port as called for by claim 1. The arguments made regarding claim 1 in the *AMENDMENT AND REPLY*s filed January 10, 2005; May 20, 2004; and February 20, 2004, are reasserted herein. Ohashi teaches a plurality of supply ports including central supply ports and outer supply

ports. As seen in FIG. 1, Ohashi at least includes a *plurality* of outer openings, not a single supply port.

It is noted that Applicants also respectfully traverse the Examiner's rejection and statement based on the grounds that one skilled in the art at the time of invention would have been motivated to modify Kawakami with Ohashi's divider based on "optimizing the dimension(s) ... for preventing particle adherence ... [and] to provide for the desired pressure gradient. Further, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art." Office Action mailed July 3, 2007, at pg. 4.

"A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." M.P.E.P. § 2144.05(II)(B). The cited art including Kawakami and Ohashi fail to recognize the correlations between the cross-sectional area of an inner tube versus arrays of small orifices in a divider; arrays of outer orifices versus backing pressure in an annular space; and a relationship between the configurations of a gas flow divider, inner tube, outer tube, and an annular space for establishing a backing pressure and uniform flow. Therefore, optimization and modification of the Kawakami and Ohashi apparatus can not be within the ranges of routine experimentation and obvious to one skilled in the art.

Furthermore, as described extensively in the application as originally filed and in previous *AMENDMENT AND REPLY*s, the dimensions and configurations of the gas flow divider, inner tube, and outer tube called for by the claims achieve the unexpected result of establishing a uniform backpressure and improved gas flow metering over conventional metering tubes. Nothing in the cited art suggests that one skilled in the art would have been motivated to combine Kawakami with Ohashi to arrive at the present invention. The combination of the claimed inner tube, outer tube, and gas flow divider among other things achieves unexpected synergies like improved gas flow metering and uniformity across the length of the outer tube without overly complex and bulky structures.

For all these reasons, claim 1 is submitted to be allowable over the cited art.

With regard to claim 4, Kawakami in view of Ohashi fail to teach or suggest a metering tube wherein "the cross sectional area of an inside of the inner tube is approximately equal to a total cross sectional area of the plurality of small orifices in said flow divider" as called for by claim 4. The Examiner admits that Kawakami fails to teach

this feature of the present invention but opines that one skilled in the art would be motivated to modify the Kawakami apparatus to create this feature in view of the teachings of Ohashi. Applicants disagree at least for the reasons mentioned above with respect to claim 1.

Neither Kawakami nor Ohashi teach the structure called for claim 4. Further, Ohashi is directed towards minimizing particulate build-up and not creating a uniform backpressure as called for by the claims. None of the cited art suggests modifying the cross-sectional area of an inside of the inner tube to equal the total cross sectional area of small orifices in the divider. As discussed above with respect to claim 1, Ohashi teaches away from the claimed invention. Ohashi teaches non-uniform flow towards a substrate rather than uniform flow.

For at least these reasons, claim 4 is submitted to be allowable over the cited art. In addition to the above, claims 4, 5, and 8, which depend from claim 1, are submitted to be allowable over the cited art for at least the same reasons noted above with respect to claim 1.

With regard to claim 11, Kawakami in view of Ohashi fail to teach or suggest the gas flow divider as called for by claim 11 for at least the same reasons as mentioned above with respect to claim 1. Additionally, Kawakami in view of Ohashi fail to teach or suggest a metering tube including a single gas supply port coupled to a gas flow divider as called for by claim 11.

Kawakami discloses a CVD apparatus with a supply pipe 5 feeding gas to a space 20. The supply pipe is not in "fluid communication with an opposite end of an outer tube ... while connected directly to only one end of the metering tube" as called for by claim 11. In contrast, the metering tube of the present invention includes a supply port and gas divider that introduces gas in a second gas flow path into an annular space at an inlet end of an outer tube and a first gas flow path through a central orifice into an inner tube. The gas flows through the first gas flow path to an opposite end of the outer tube and then flows back into the annular space to create a uniform backing pressure with a single gas supply port.

Kawakami in view of Ohashi fail to teach or suggest a gas supply port comprising "a block having a pocket formed therein," a gas supply connector, and a hollow tube assembly as called for by claim 11. The Examiner admits that Kawakami and Ohashi do not teach such a gas supply port but suggests that U.S. Patent No. 5,685,942 to Ishii ("Ishii") teaches such a feature. Applicants disagree. Ishii merely teaches a pipe connected at one end to two pipes.

In fact, the described embodiment teaches the processing gas being "supplied from *a lot* of supply ports 87 ... which opposes the supply ports 87." Ishii, col. 8, lines 33-36. Ishii therefore teaches use of a plurality of supply ports rather than a single supply port.

Applicants also traverse the rejection of claim 11 based upon the Examiner's suggestion that it would have been obvious to substitute a block as called for by the claim for the pipes taught by Ishii. The Examiner correctly states that Kawakami, Ohashi, and Ishii all fail to teach a block as called for by claim 11. Applicants disagree that the block structure called for by claim 11 requires a mere obvious substitution. First, there is no teaching or suggestion to make such a substitution. Ishii teaches a combination of supply ports into a uniform flow, not dividing flow from a single supply port. Second, the block called for by the claims requires more than mere substitution. Claim 11 calls for a supply port comprising a block having a pocket formed therein, a gas supply connector coupled to said pocket, and a hollow tube assembly coupled to said pocket and said inlet ends of the inner and outer tubes. None of the cited art teaches or suggests such a gas supply port structure. Should the Examiner maintain this rejection, Applicants respectfully request citation of a reference in support of the Examiner's position. See M.P.E.P. § 2144.03.

For at least these reasons and those made above with respect to claim 1, claim 11 is submitted to be allowable over the cited art.

Claim 6

Claim 6 stands rejected under 35 U.S.C. 103 as being unpatentable over Kawakami in view of Ohashi and further in view of Ishii. Applicants respectfully traverse. Applicants herein reassert the arguments made above with respect to claim 11. In particular, Kawakami, Ohashi, and Ishii, alone or in combination, fail to teach or suggest the gas supply port called for by claim 6. In addition, claim 6 depends from claim 1 and is submitted to be allowable over the cited art for at least the same reasons noted above.

Claims 7, 9, and 10

Claim 7 stands rejected under 35 U.S.C. 103 as being unpatentable over Kawakami in view of Ohashi and further in view of U.S. Patent No. 4,836,246 to Lemp ("Lemp"). Claims 9 and 10 stand rejected under 35 U.S.C. 103 as being unpatentable over Kawakami in view of Ohashi and further in view of Applicants own U.S. Patent No. 5,849,088. Applicants respectfully traverse. The cited art fail to teach or suggest the gas delivery metering tube including standoff spacers, injector assembly, and shield assembly as called for by claims 7,

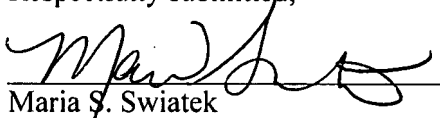
9, and 10. Further, Applicants respectfully submit that claims 7, 9, and 10, which depend from claim 1, are allowable over the cited art for at least the same reasons noted above.

CONCLUSION

In light of the above amendments and remarks, the Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 843-4000, if a telephone call could help resolve any remaining items.

Respectfully submitted,

Date: August 24, 2007



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